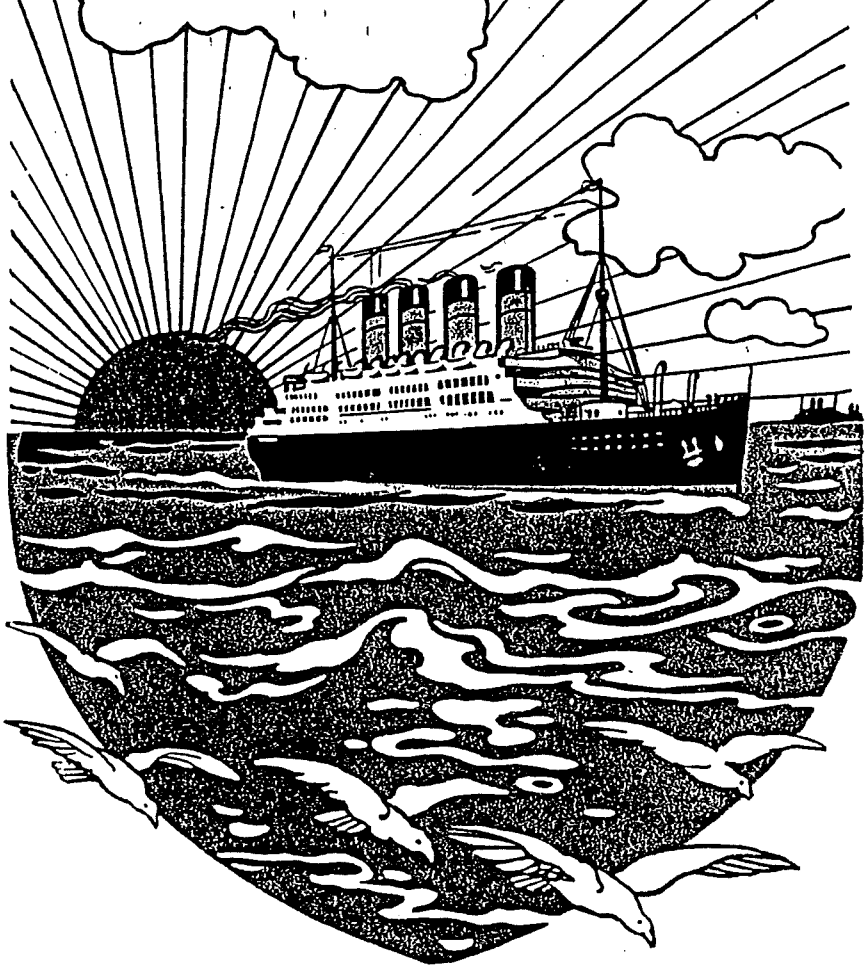
HINTS FOR USERS.

PULSYNETIC IMPULSE CLOCKS

MARINE TYPE.



GENT & Co., Ltd.
Faraday Works,
LEICESTER.

PUL-SYN-ETIC ELECTRIC.

HINTS FOR USERS OF
PUL-SYN-ETIC
Electric Impulse Clocks, Marine Type.

The outline herewith shown gives diagrammatically the arrangement of the Circuit, and it will be seen that all the Clocks are connected in simple series.

Incidentally it shows all the necessary Apparatus that goes to make up a modern Impulse Clock System—Marine Transmitter, Clocks, Potentiometer, and the connections for the Advance and Retard Mechanism.

If a Battery of Leclanche Cells or of Dry Cells or Accumulators is employed, it will be put into the Circuit where the Potentiometer is shown.

A varying number of Clocks may be found connected in the Circuit.

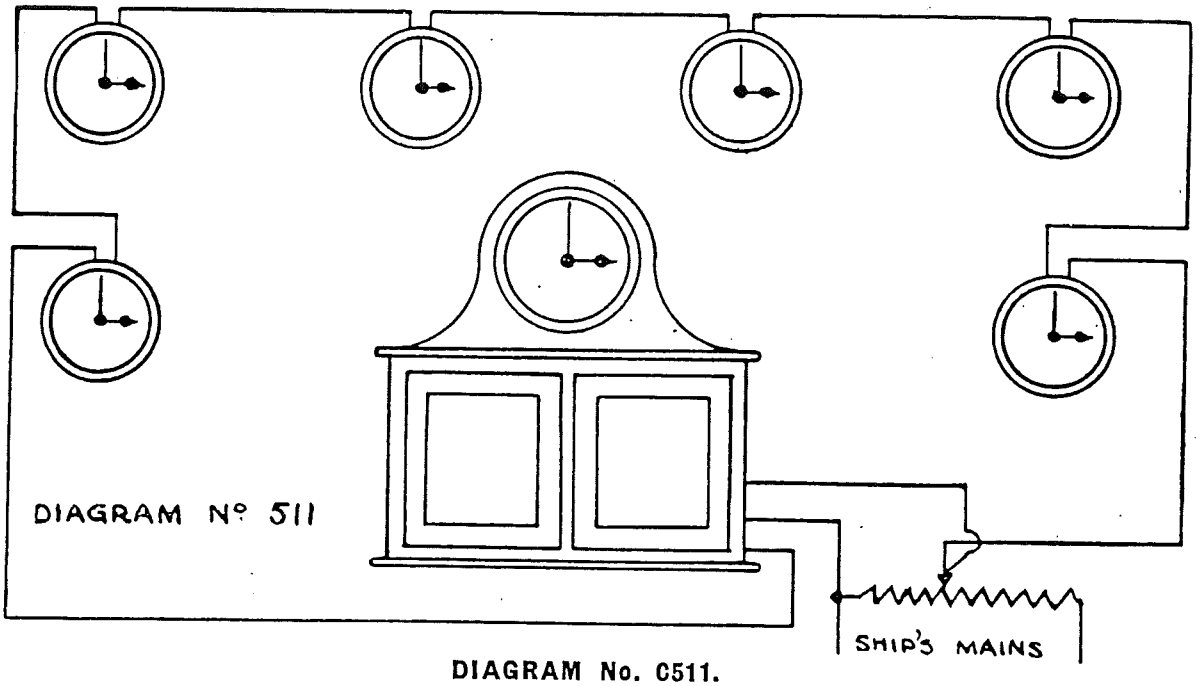


DIAGRAM No. C511.

A Circuit sometimes includes wiring led off in loops, and for this purpose a special Junction Box is often employed. With this when it is desired to cut out a loop, screw plugs can be inserted so that any particular circuit is shorted.

THE CIRCUIT.

(1).—As all Clocks are in series, in case of trouble, see that such series circuit is complete, free from intermittent faults. A broken wire or a cut wire is sometimes, but seldom, the cause of a faulty circuit, although workmen have been known to cut wires, not appreciating they were the Clock Circuit.

Loose Terminals are often the cause of any intermittent faults that do occur. This may be due to vibration. Test with a screwdriver, and see all terminals are quite tight. Appearances are often deceptive. Where sweating lugs have been employed, see they have not turned and made the terminals loose.

(2).—See that the Potentiometer or battery is all in order and that a current is always there, and that at each half minute the necessary current, i.e., 0.38 amp. is supplied to the Transmitter, also that it goes round the circuit.

The standard Current Impulse is of such short duration that an ordinary ammeter is useless, unless the contacts of the Transmitter are " made " for a definite time while the ammeter is read. Remember this when testing. A shilling inserted between contacts insures a good " make." Don't force the contacts together or you will spoil or break the escapement.

(3).—Don't at once blame the Transmitter. First, see the circuit is complete and the potentiometer or battery current is all in order; when so proved, then, and not till then, consider the Transmitter.

(4).—The Transmitter may be a great help in ascertaining the condition of the Clock Circuit. For instance, if the System has stopped for want of current, the Driving Lever "A" (Diagram C517) of the Transmitter is down, and the Contacts "E" and "D" are together in contact. This condition might indicate that any current there is insufficient to lift the Driving Lever.

(5).—If the Pilot Dial does move, it is an indication that current is flowing, but that it is insufficient to lift the Driving Lever. If the Pilot Dial does not move, it is an indication that the circuit is broken.

(6).—To test for such insufficient current, lift the Driving Lever by hand and see that the armature follows or attempts to follow. At the same time note if the Pilot Dial moves forward half a minute on the contact being broken at "E" "D."

(7).—A good test for a faulty Circuit is to set the Retard Mechanism of the Transmitter and attempt to Retard (by pressing Retard Key) and then see if the Driving Lever is lifted.

(8).—When the Retard Mechanism is in operation the Transmitter movement alone operates, and the Pilot Dial and the Clocks in the Ship's Circuit are not driven. "The Retard" operates on a Local Circuit, which includes a resistance equal to that of all the Clocks in the Circuit.

(9).—If in this experiment the Driving Lever is lifted by the Electro Magnet and the Transmitter does not start up, it can be so started by pressing the "Advance" Key once. This mechanically sets the Escapement ticking by "wiping" the Balance Wheel, and incidentally replaces the Retard Key, which must be again pressed if the experiment is to be continued.

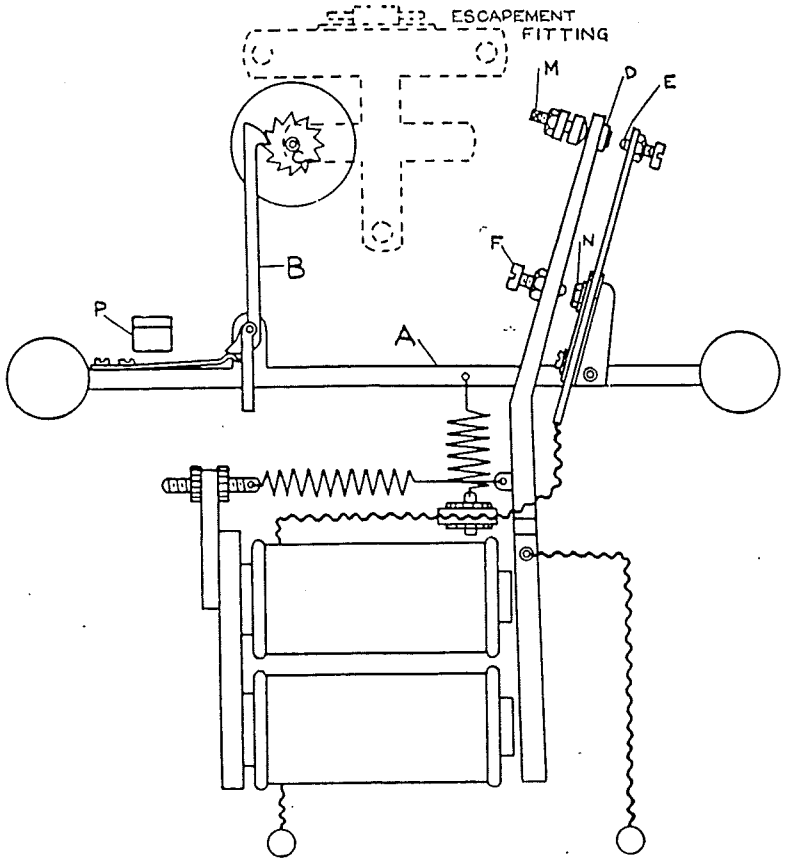


DIAGRAM C517.

PUL-SYN-ETIC ELECTRIC.

TRANSMITTER, Marine Type.

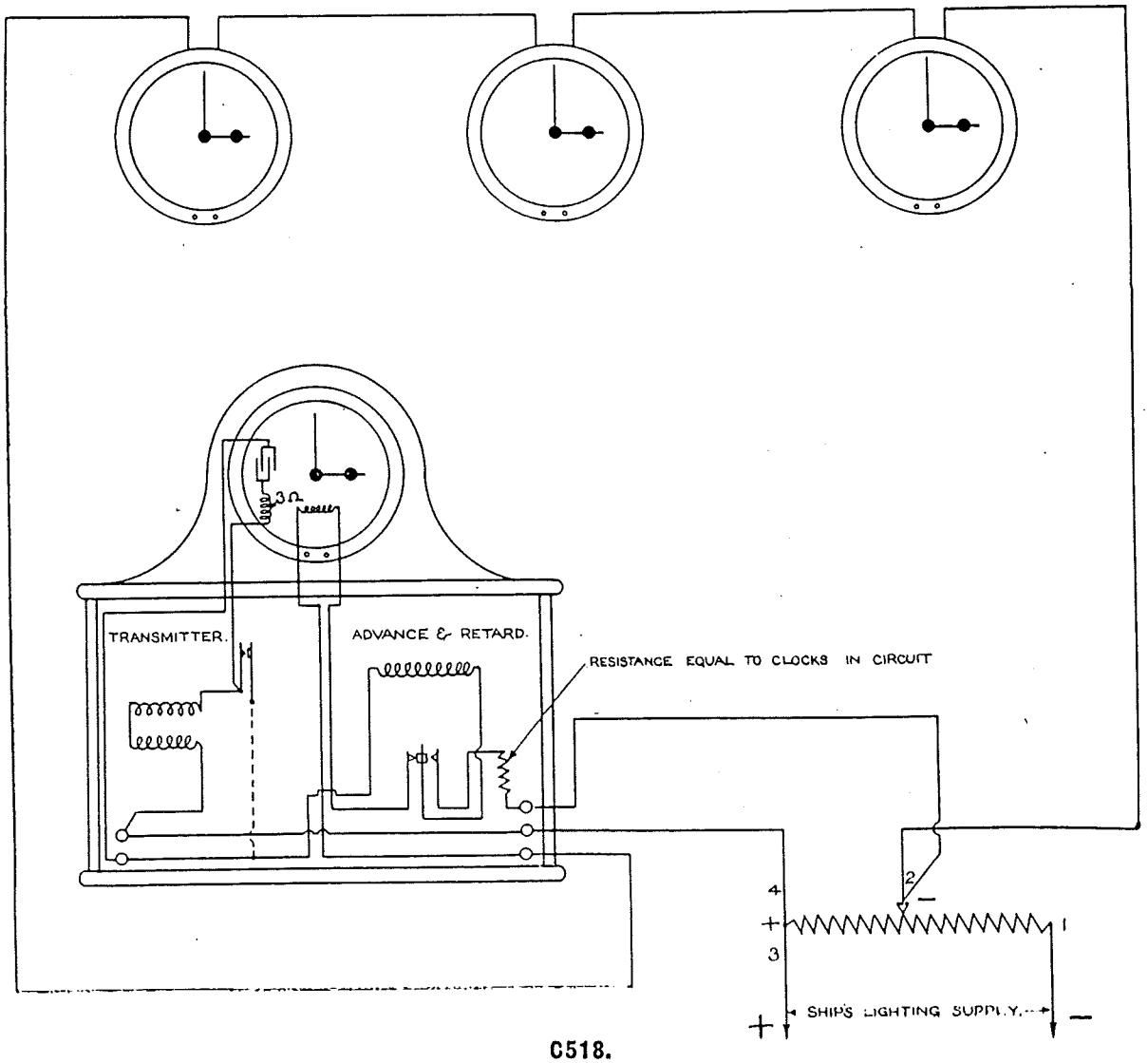
(10).—The chief duty of the Mechanism is to send at every half minute to the Ship's Clocks an electrical impulse from a source of electrical energy. This is effected by the time-keeping and contact-making Mechanism in the Transmitter.

(11).—*The Power for driving the Train of Wheels and Escapement is obtained by the Driving Lever " A " falling gradually. When it gets " down " contact is made between " D " and " E " and the Lever is immediately thrown up by the electro magnet. It will be seen the Pawl " B " hauls on to the ratchet wheel which drives the escapement fitting.*

The Contacts " D " and " E," besides energising the Electro Magnet, also send a current round the Impulse Clock Circuit, and move the Impulse Clocks one impulse.

(12).—The functions of the Breaking Stops " F " and " N " are explained by reference made under the article on Re-adjustments, paragraph 20.

Reference to Diagrams C517 and C518 makes all this quite clear.



C518.

(13).—It will be noticed from the Diagram that when the Advance mechanism is in operation all the Impulse Clocks are in the circuit.

(14).—When the Retard Mechanism is operated the Pawl " B " still hauls on to the escapement, but a resistance is put into the circuit instead of the Impulse Clocks, thus the Transmitter operates for the given number of half minutes without either the Pilot Dial or the Ship's Clocks.

(15).—*When the Advance Mechanism operates, the Pawl " B " is thrown back, the Escapement stops and a Fan moves quickly instead of the Balance Wheel.*

The Advance Key has the faculty of wiping the balance wheel when operated, and so ensures its starting up.

(16).—The Escapement fitting, shown by dotted lines in Diagram C517, is the most delicate part of the Transmitter. Its bearings are jewelled, and this mechanism must be handled with great care, as a watch maker would handle it, and it must not be treated roughly. Particular attention is called to this mechanism when oiling (see paragraphs 23, and 30 to 37).

The Escapement fitting will require cleaning and oiling only just as does that of an ordinary Marine Mechanical Clock.

Transmitter, Marine Type.
TO RE-ADJUST ITS CONTACTS.

(17).—*Don't monkey with the Transmitter, but if for any reason Contact adjustments become necessary, note the following points carefully :—*

(18).—The adjustment of the Contacts must allow for the requisite amount of up and down movement of the Driving Lever " A," the object being to get sufficient movement to enable the Driving Pawl " B " to feed forward one tooth of the Ratchet Wheel at each downward stroke.

(19).—A gap of $\frac{3}{16}$", not more, between the Contacts " D " and " E " when the Driving Lever is pressed firmly against the felt stop " P " gives the requisite stroke.

The movement of the armature is limited by the poles of the Magnet on the one side and the fixed but adjustable stop " M " on the end of the armature on the other side, and this stop is adjustable only in order to obtain the necessary latitude of movement, namely, $\frac{3}{16}$".

The contact-breaking fixed but adjustable stop " F " on the armature performs an important function, and is set in the following manner :—

(20).—Hold the armature firmly against the poles of the Magnet and see if the point of the screw " F " presses against the head of the steel stud " N," which is opposite to it, and in so doing, see the Driving Lever rises up to the padded stop " P," and at the same time causes the contacts to separate $\frac{1}{32}$".

(21).—These tests should be first made with the current entirely " off " and afterwards confirmed with the current " on," but in this latter case the key mechanism must be set to Retard, or otherwise any vibrating contact which may occur will set the Ship's Clocks out of step.

Transmitter, Marine Type.
SPARE ESCAPEMENT FITTING.

(22).—*A big responsibility depends on the Escapement Fitting of the Transmitter. (This is shown dotted in Diagram C517 below, and illustrated at Fig. C93.) Therefore, a Spare Escapement Fitting is, or should be, provided and available. It is generally provided and kept in a cradle fixed in the left-hand side of the Transmitter Case.*

(23).—*When the Escapement Fitting in use requires cleaning or other attention, remove it by unscrewing the three screws marked " X " in Fig. C93, and carefully push back the Hook or Pawl " B " in diagram, which engages the Ratchet Wheel sufficiently far to enable the removable part to be taken away. This must be done carefully and without force, and current must be cut off before attempting to remove an Escapement Fitting.*

(24).—*The Spare is then fixed in its place, and the Escapement Fitting which has been in use can be sent, carefully packed, to a watchmaker, or better still, to the makers, Gent & Co., Ltd., Faraday Works, Leicester, England, for attention and overhaul. When returned, it should be secured and kept as the Spare Escapement Fitting.*

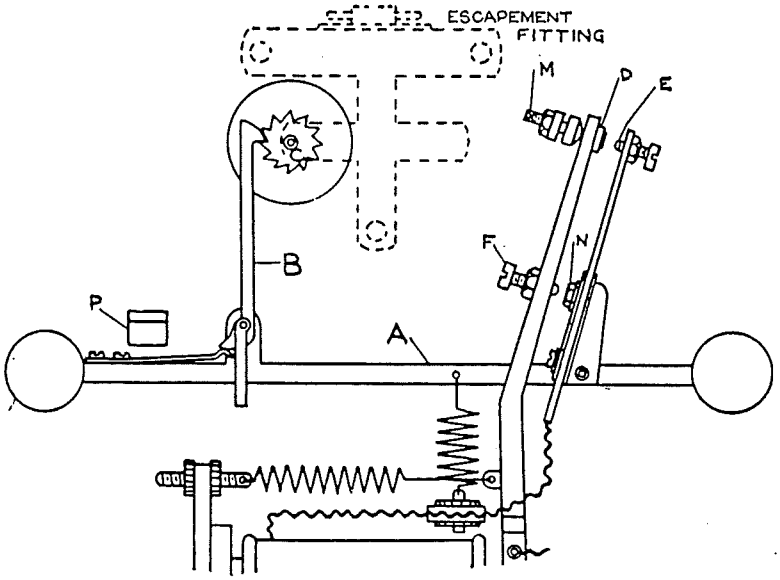


FIG. C517.

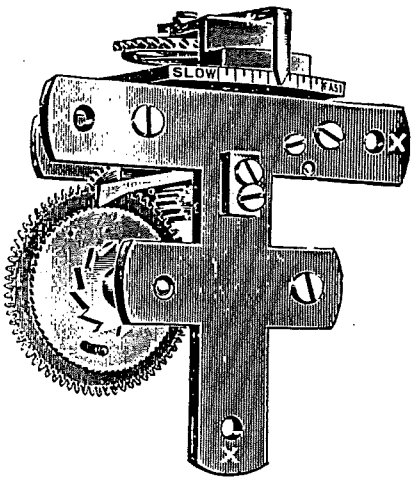


FIG. C93.
Escapement Fitting.
Cradle not shewn.

(25).—*If it is found that the Balance stops before the Contacts in Transmitter " DE " meet (and this after pressing the Advance Lever once, which starts up the Escapement) an obstruction must be looked for in the Escapement Fitting, and if it is not apparent what the undue friction or fault is with the Train or the Escapement, it should be sent to the makers, as suggested. Meanwhile, the Transmitter employs the Spare Part.*

Transmitter, Marine Type.

AUTOMATIC ADVANCE AND AUTOMATIC RETARD.

A further duty of the Marine Transmitter is to provide means of automatically advancing the Clocks when sailing East, or of automatically retarding the Clocks when sailing West.

(26).—Such Mechanisms consist of a Setting Dial with its pinch-levers and two Keys marked "Advance" and "Retard." This Mechanism will be found in a separate compartment, generally on the right of the time-keeper, and the toothed wheel, when operated for Advance, takes one step for every time contact is made at "D E."

By means of the Pointer and its pinch-levers, the Mechanism can be set to any number of minutes Advance or Retard.

(27).—*If the Ship's Clocks have to be Advanced, press the Advance Key, and the Driving Lever "A," instead of descending slowly, will descend rapidly, controlled only by the Fan, and Contacts "D" and "E" meet approximately every second, so all the Ship's Clocks are rapidly "Advanced" the number of minutes allowed for on the Setting Dial. On reaching zero, the "Advance" is disengaged, and the Pawl "B" drives its ratchet wheel normally as before.*

(28).—*To Retard the Ship's Clocks, the Pointer and its pinch-levers are set to the desired number of minutes, and the Key marked "Retard" is pressed. The toothed wheel now advances in half-minute steps until the Pointer reaches zero, when the Retarding Key is automatically released and the Ship's Clocks are re-connected and driven in normal half-minute steps.* The effect of the Retard is to hold up the Ship's Clocks for the required period of time, a resistance being switched in the circuit in lieu of the impulse clocks.

The action of the parts of the Mechanism of the "Advance" and "Retard" can be readily seen, and any derangement should be speedily recognised.

(29).—"ADVANCE"—FAILING TO OPERATE. If the fan refuses to rotate when the "Advance" is set for advancing the Clocks, see if it is obstructed by carefully turning it by hand. If no definite obstruction is found, carefully wipe through the teeth of the pinion with the point of a sharpened skewer, as described, so as to be assured that the obstruction is not in the pinion. Also brush out the teeth of the wheel which drives the disc pinion. If no definite obstruction is found, oil the pivots of the fan and of the wheel which drives it, afterwards moving the spindles end-wise to work in the oil and work the dirt out. Remove superfluous oil with a clean duster.

Transmitter, Marine Type.

OILING

THE CLOCK MECHANISM.

(30).—*It must be remembered that this Mechanism is really a Clock and only Clock Oil may be used under any circumstances, and even this very sparingly. A piece of wire with a flattened end, about* 18 *Gauge, a hat pin or a hair pin forms the best oiler.*

(31).—All Pivots of the Mechanism must be oiled, one drop only for each pivotted part or studs on which such parts turn. The oiling must be carried out methodically, otherwise pivots are missed. Reach through the frame from the front to oil the back of pivots.

(32).—Before oiling anything, any dust seen in teeth of wheels must be brushed out (a dry tooth brush is useful for this purpose), and this can be done with advantage while the wheels are revolving. Dirty oil must also be wiped away from the pivots and parts, and for this use a clean duster free from fluff.

(33).—If the Wheels of the Escapement Fitting, shown at Fig. C93, refuse to rotate with the descent of the Driving Lever "A" and a definite obstruction is suspected, the Escapement Fitting should be removed and examined, but before removing the same put, say, a visiting card between the left-hand Contacts of the Retard Lever, and so prevent the flow of current, which will cause chattering at the Contacts all the time the Escapement Fitting is thus removed.

(34).—It may be found that there is dirt in the teeth of the wheels just where they are engaging the pinion. Any such dirt or dust must be carefully removed by the point of a wooden skewer or a piece of peg wood by carefully stroking between the teeth of wheel and pinion.

(35).—If an obstruction is found and removed, apply gentle pressure to the ratchet wheel in an anti-clockwise direction, and provided the Escapement Fitting is in order, the Balance Wheel should operate. Start the Balance Wheel with a gentle touch if necessary. If it still fails to operate, read paragraph 25.

(36).—The Escapement proper, with its horizontal Platform, only requires its Pivots oiling when it is cleaned by a Clock maker. The Steel Pallets may, however, be oiled only in the following manner :—

(37).—*While the Escapement is working, hold the tip of the oiler with its drop of oil close to the Scape Wheel so that the teeth of this wheel, in passing, each takes a little oil. The teeth should touch the drop of oil, but not the oiler. Sufficient oil thereby is passed on to the Steel Pallets.*

(38).—*The teeth of the Wheel Train must not be oiled, and be careful that no oil whatever gets on to the hair spring of the Balance.*

PUL-SYN-ETIC ELECTRIC.

THE IMPULSE CLOCK PROPER.

(39).—All Marine Impulse Clocks contain a Step-by-Step Mechanism similar to that illustrated at Fig. C9. When this is fixed in a case without exposed Terminals, two studs are provided at the bottom of the Clock front. These are illustrated clearly at Fig. C138.

(40).—By means of these Studs, the individual Clock can be " shorted " if fast, and advanced by means of a Dry Cell if slow. The studs are a precautionary arrangement to avoid the necessity of taking the Clock down in case adjustment of the clock hands is found necessary.

(41).—The Movement is set with an Ammeter in Circuit by the Makers, and it is essential that an Ammeter be used when any adjustment is made, and that the Movement will operate with a current of 0.20 amp., not more or less.

(42).—*Any adjustment made without the precaution of an Ammeter will only end in future trouble. The Re-adjusted Impulse Clock may operate on the Current as supplied by the transmitter, but if for any reason this falls very slightly below standard, then the misadjusted Clock again fails.*

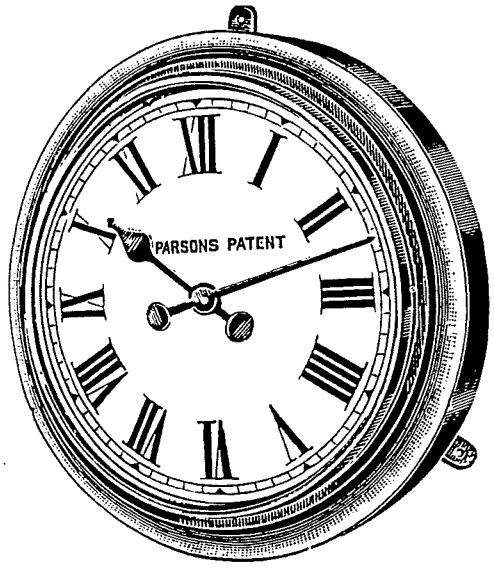


FIG. C138.

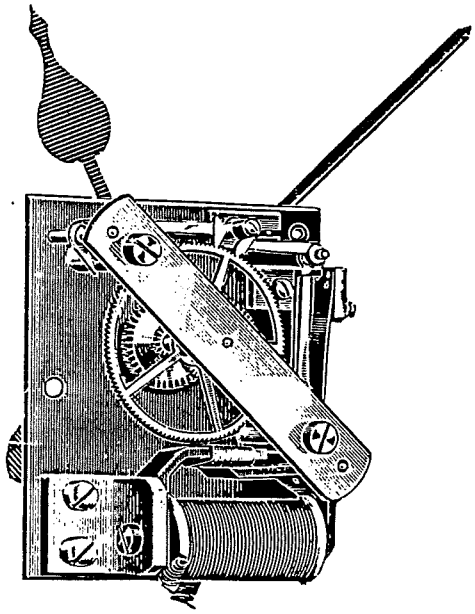


Fig. c 9.

(43).—*The remarks about oiling in paragraph* 30 *apply equally to the Impulse Movements.*

All Pivots, also the acting end of the Driving Spring and the Stud on which the Driving Pawl works, may be oiled, but the Ratchet Wheel and the driving ends of the Pawls may not be oiled in any circumstance. They must, however, be left perfectly clean. Any dust or dirt on these parts must be carefully removed. This remark particularly applies to the brass pin forming the forward stop of the Driving Pawl.

REPLACE THIS IN THE RECEPTACLE PROVIDED IN TRANSMITTER CASE SO THAT THE WORD "HINTS" IS VISIBLE.

HINTS FOR USERS

HINTS FOR USERS

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